

UNDERWATER INSPECTION REPORT
FOR
THE HOMER HADLEY FLOATING BRIDGE
BRIDGE NO. 90/25N



SEPTEMBER 2006

PREPARED FOR

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

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INSP Report
Anchor Form
Daily Diving Report

EXECUTIVE SUMMARY

The underwater inspection of the Homer Hadley Floating Bridge revealed all of the inspected components to generally be in good condition. The exceptions to this were Cables Asw, B_N, C_N, D_N, D_S, E_N, E_S, F_N, F_S, G_S, H_N, L_{4s}, M_N, O_N, and Q_N, which were only considered to be in satisfactory to fair condition. The lower rating for the indicated cables was due to new or previous broken wires found at various areas throughout the inspected lengths. It should be noted that Cable Asw contained numerous (up to eight) broken wires, not previously reported, within the pontoon port. Due to the location of the breaks, Cable Asw was (unfeasible) not repaired during the inspection; however, WSDOT personnel were notified of the situation.

The boater protection system consisting of a UHMW buoy clamp and phillystran aramid fiber rope system was generally in good condition and functioning well, except at Cables N_N and J_N where either the buoy or rope had become unattached from the cable due to missing clevis pins and cotter pins, as well as general wear on the connection components. WSDOT Bridge Maintenance crews provided the necessary connection hardware (bolts/clevis pins) to the Collins Inspection Team, and permanent connections between the detached components were made at these cables during the fieldwork. It should be noted that the detached connection conditions at the buoy clamp attachments can be directly attributed to a pin of insufficient diameter used in the fitting at the top of the buoy clamp, which allows considerable movement and subsequent wear (noted at all buoy clamp clevis pins) under wave action and/or bridge cable oscillations. At Cable Q_N, the clevis pin at the buoy had pulled through and the loose end of the connection rope was retrieved to be re-attached by WSDOT crews.

With respect to the amount of corrosion found at all of the cables, it has increased minimally since the previous underwater inspection. Mostly moderate to, at times, somewhat heavy corrosion was often observed near the pontoon ports, occasionally with slight section loss of the exterior wires due to the early stages of pitting. It should be noted that the manufacturers of structural strand estimate a life expectancy of 15 to 20 years for this type of cable under purely static conditions in an

aquatic environment. Given the age of the cable and some of the deficiencies now present, it is recommended that the cable replacement program be continued. Those cables having the heaviest corrosion with associated section loss and/or broken wires, Cables ANW, ASW, BN, Bs, CN, Cs, DN, Ds, EN, Es, FN, Fs, Gs, HN, Ks, L1s, L3s, L4s, L6N, L6s, Ls, MN, Ms, Ns, ON, Ps and QN should be considered for replacement. If a decision is made to replace cables as a part of WSDOT's on-going bridge maintenance program, Cables ASW, BN, CN, DN, Ds, EN, Es, FN, Fs, Gs, HN, L4s, MN, ON, and QN should be given the highest priority for replacement due to the extent of broken wires present. In the interim, it is recommended that the cables with heavier corrosion, section loss, and broken wires be monitored closely during future biennial underwater inspections.

One significant finding to note relates to two, apparently abandoned bridge cables in contact with longitudinal Cable L1s (observed during ROV inspection to the point of embedment in the lakebed). Presently, no significant abrasion or chaffing was observed; however, the potential for such in the future is good. A review of the existing bridge plans depicts a sunken pontoon (Lacey V. Murrow Pontoon H) in the vicinity of the Anchor L1s. Based on this finding, it is assumed that the cables in contact with L1s are abandoned anchor cables associated with the sunken pontoon. Although the abandoned anchor cables are inactive, Cable L1s is active and moves as a result of dynamic loading, which can lead to cable abrasion. Therefore, Cable L1s should be monitored during future inspections to ensure that contact between the cables does not result in abrasion damage to Cable L1s. (It should be noted that similar abandoned cable contact was identified during the 2002 inspection at Cables L1N and L6N, which appears to be related to the same or other sunken pontoons.)

With regard to the inspected pontoons and their respective joints, they were essentially found to be free of significant deterioration or damage. Likewise, no detrimental conditions were noted for any of the inspected anchors. The Type "A" Fluke anchors, except for Anchors CN, GN, LN, and Qs, were observed to have either the cable or eyebar entering the lakebed with no detectable anchor exposure. For Anchors CN, GN, LN, and Qs, the eyebar near the socket and the upper portions of the anchor flukes were exposed. The exposed portions of the flukes or other

components were typically in good condition with no structural deficiencies noted. The sunken pontoon connections of Cables L4s, L5s, and L6s were also in good condition with no significant deficiencies. In light of the present condition of the pontoons and anchors, no recommendations are warranted for these items at this time.

Refer to the end of Appendix B for specific recommended repair and maintenance items along with their respective priority ratings. In addition to the inspection finding documentation provided herein, inspection videos showing the ROV inspections and specific or typical conditions have been furnished.

UNDERWATER INSPECTION REPORT

FOR

THE HOMER HADLEY FLOATING BRIDGE

BRIDGE NO. 90/25N

1.0 INTRODUCTION

1.1 Scope of Inspection

This report presents the observations made and data recorded during a detailed underwater investigation done on selected pontoons, cables, and anchors of Bridge No. 90/25N, the Homer Hadley Floating Bridge. The underwater investigation was conducted by Collins Engineers, Inc. for the Washington State Department of Transportation (WSDOT) in September of 2006.

Based on WSDOT's assigned scope of work, Pontoons C, F, I, L, O, and R were given a complete "swim-by" inspection with cleaning of random or suspect areas for a more detailed examination. The majority of the bridge cables were fully inspected from the pontoon port to a water depth of 50 feet, with cleaning again as required. For those cables with boater protection buoy attachments, the inspection was continued to a water depth of 75 feet to reach all buoy line clamps. In addition, Cables C_N, C_s, E_N, E_s, G_N, G_s, I_N, I_s, K_N, K_s, L1_s, L4_s, L5_s, L6_s, L_N, M_N, M_s, N_N, O_N, O_s, Q_N and Q_s were entirely inspected from the pontoon port to the anchor. The inspection of these cables also included a complete inspection of the anchors and their various components when exposed. For those cables and anchors in water depths of 100 feet or less, the inspections were accomplished by diving. For the deeper cables and anchors, the inspections were conducted with the use of a remotely operated vehicle (ROV) supplemented by diving as required. Refer to the figures in Appendix A for the general layout of the bridge and the items inspected.

2.0 EXISTING CONDITIONS

2.1 Pontoons

The pontoons selected for inspection were in good condition underwater with no structurally significant defects observed. The various surfaces of the pontoons typically only had random, minor surface irregularities as the result of original forming, minor regions of poor consolidation, and small areas of section loss. The joints along the inspected pontoons were typically in good condition with no notable bulging, tearing, or displacement of the membrane material.

Refer to the Pontoon Inspection Summary Table, included in Appendix B, for a list of specific deficiencies found in Pontoons C, F, I, L, O, and R. Refer to Photograph Nos. 1 through 3, in Appendix C, for views of the typical pontoon conditions.

2.2 Cables

The cables inspected, either completely or to a water depth of 50 or 75 feet, were generally in good to satisfactory condition with most often light to, at times, moderate corrosion within the pontoon ports. There were, however, some cables that were deemed in more satisfactory to, at times, fair condition due to heavier amounts of corrosion. Mostly moderate to, in some instances, heavy corrosion was present on 31 of the 52 bridge cables and typically covered 75 to 100 percent of the cable surface from the pontoon port to a water depth of up to 10 feet. Below the 10-foot water depth, the corrosion was still present, but was generally much lighter in extent and covering only 10 to 50 percent of the total surface area of the cable. In most instances, the corrosion was limited to the cable surface and consisted of rust nodules up to ¼-inch thick. Careful cleaning of the corrosion often revealed the early stages of exterior wire section loss due to pitting that was up to 1/32-inch deep. Overall, the corrosion on the cables has increased only slightly since the previous inspection.

The cathodic protection system in place at the bridge appears to be functioning fairly adequately and has likely slowed the corrosion development and helped maintain a normal or slower than normal deterioration process.

Cables Asw and H_N were the only cables found to have newly broken wires. At Cable Asw, the breaks (estimated at six to eight individual breaks) were present within the pontoon port between the opening and 10 feet into the port. The broken wires were not previously reported and appeared to have occurred since the last inspection in 2004. Due to limited accessibility within the pontoon port, seizing repairs of the loose wire ends could not be performed at this cable location. However, the conditions were documented and reported to the appropriate WSDOT personnel (on-site and bridge preservation staff). Cable H_N contained one, not previously reported, broken wire at a water depth of 48 feet. With the exception of Cable M_N the previous broken wire repairs on Cables B_N, C_N, D_N, D_s, E_N, E_s, F_N, F_s, G_s, L_{4s}, O_N, and Q_N were intact and sufficiently holding the ends of the broken wires. The previous seizing repair, at a water depth of 5 feet, of Cable M_N had loosened and was not sufficiently restraining the broken wire ends. During the inspection, the new broken wire at Cable H_N and the previously seized broken wires of Cable M_N were repaired.

During ROV inspection of longitudinal Cable L1s, two (apparently abandoned) cables were observed to be resting against the surfaces of the active anchor cable between water depths of 160 and 161 feet. The first cable was resting against the bottom surface, while the second was resting against the top surface of Cable L1s. No significant abrasion or chaffing was observed on Cable L1s during this inspection. Based on a review of available bridge plans, it appears that an abandoned pontoon (Pontoon H) from the Lacey V. Murrow Bridge is resting on the lakebed in close proximity to Anchor L1s. Because of the presence of the sunken pontoon, it is highly probable that the cables contacting L1s are inactive anchor cables from the abandoned pontoon. (In 2002, similar abandoned cable contact was noted at Cables L1_N and L6_N.)

Consistent with previous underwater inspections, the current inspection of the cables also revealed numerous random locations with one or more loose wires bulging from the perimeter of

various cables. In addition, there still exists a few instances of minimal cable clearance at the pontoon ports, some with protective measures in place to be discussed later; however, no evidence of any contact and related cable damage was found.

All of the inspection findings for the cables are detailed in the Inspection Summary Table, and views of the various typical and specific cable conditions can be seen in Photograph Nos. 4 through 28 in Appendix C. For the composition and sizes of the wires in the bridge cables, refer to Appendix E.

The boater protection system, which is comprised of UHMW buoy clamps and phillystran aramid fiber ropes, was generally in satisfactory condition and functioning adequately. It should be noted, however, that all of the buoy clamp clevis pins, except at Cables J_N, N_N, and Q_N, exhibited significant wear resulting in an average section loss of the pin of 30 percent. In one instance, Cable C_N, the clevis pin exhibited section loss of approximately 50 percent. The clevis pin wear can be attributed to pins of insufficient diameter being used that allow pin movement and resulting wear under wave action and cable oscillations. For Cables J_N and N_N the rope had come unattached from the buoy clamp assembly at the bridge cable due to a missing clevis pin and cotter pin. Cable Q_N was disconnected at the buoy due to a failure of the rod assembly through the buoy. WSDOT Bridge Maintenance crews provided the necessary connection hardware (shackle, bolt, and cotter pin) to the Collins Inspection Team, and attachments between the buoy clamp and the fiber rope were installed at Cables J_N and N_N during the fieldwork. At Cable Q_N, Collins retrieved the loose end of the phillystran aramid fiber rope for WSDOT crews to re-attach the buoy. It should be noted that the rope of Cable D_N had incurred considerable abrasion damage near the cable clamp. The sheathing of the rope was chaffed through completely, exposing its core. WSDOT Bridge Maintenance personnel were notified of the rope's condition.

The pontoon ports for all of the anchor cables were inspected to check the cable-to-port clearances, as well as for any cable-to-port contact. All of the UHMW pads at the longitudinal cables and protective rubber sleeves at various other cables, examined during the inspection, were

generally found to be in good condition and performing adequately, with the exception of Cables Asw and L6s. The protective sleeve of Cable Asw was found have loose banding within the pontoon port, resulting in a 4 to 6 inch gap exposing the cable (relates to the multiple broken wires). Additionally, a majority of the protective sleeve banding outside of the pontoon port was broken. Cable L6s was found to have neither the UHMW pad or rubber sleeve present at the time of the inspection, but the clearance (approximately 8 inches) between the cable and the pontoon port was sufficient to prevent a chaffing (contact) situation under regular operating conditions.

Cables A_{SE}, A_{SW}, R_{SE}, and R_{SW} were also inspected for any damage due to possible contact with the underside of the pontoons of the Lacey V. Murrow Bridge. Both Cables A_{SE} and A_{SW} had 3 to 4 feet of clearance between the cable and the Pontoon B above. However, there were not any UHMW pads on the bottom of Pontoon B to protect the cables should there ever be any contact with the pontoon. Cable R_{SE} had 3 feet of clearance between the cable and the Pontoon R above, while Cable R_{SW} had 8 inches of clearance between the cable and the pontoon. Pontoon R did have UHMW pads on the bottom surface of the pontoon directly above the R_{SE} and R_{SW} cables. In addition, Cables A_{SW}, A_{SE}, R_{SE} and R_{SW} had protective rubber sleeves on the cables, as another means of protection against contact with the pontoon, and the sleeves were observed to be in good condition and functioning as intended.

2.3 Anchors

All of the anchors and their various components that were inspected were in good condition and free of structurally significant defects. Type “A” Fluke Anchors E_N, L_{1s}, and M_s were each found to have the cables penetrating the lakebed with no exposure of the eyebar and/or anchor. Type “A” Fluke Anchors C_s, E_s, G_s, I_s, K_s, M_N, and Q_N were found to have eyebar exposure ranging between 1 and 10 feet in length, with no exposure of the anchor flukes detected. Type “A” Fluke Anchors C_N, G_N, L_N, and Q_s were found to have lengths eyebar exposure ranging from 3 to 10 feet, with exposure of upper portions of the anchor flukes ranging in height between 6 inches and 8 feet. The exposed portions of the concrete flukes were in good condition with no structural deficiencies

noted. At all of the anchors, the various steel components, including cable sockets, pins, and eyebars, were always found to be sound with a minimal amount of light to moderate corrosion. Ropes and small diameter steel cables left from original construction were often found on and around the cables or attached to the eyebars near the lakebed. For views of the various anchors conditions, refer to Photograph Nos. 29 through 39 in Appendix C. Refer to Appendix D for the completed inspection forms for the various anchors inspected.

For a presentation of the more significant and specific findings at the pontoons, cables, and anchors, again refer to the figures in Appendix A.

3.0 EVALUATION AND RECOMMENDATIONS

In most instances, the pontoons, cables, and anchors inspected were generally in good condition. As previously discussed, six to eight broken wires on Cable Asw were found and could not be repaired due to inaccessibility to the interior of the pontoon port. The one broken wire of Cable H_N was repaired by seizing with cable ties. The boater protection system consisting of UHMW buoy clamps and phillystran aramid fiber ropes was generally in satisfactory condition and functioning adequately; however, significant section loss was observed on the buoy clamp clevis pins due to wear. Cables J_N, N_N, and Q_N were not functioning as intended, as the buoy rope was detached either from the buoy clamp or the buoy due to a failure of the connection assembly. The wear-related section loss of the buoy clamp clevis pins, which is related to the pins being too small in diameter, will progress over time, resulting in eventual failure of the connection. Although loss of the boater protection system is highly unlikely due to the connection failure, the system would be able to move towards the bridge under northerly, easterly, and westerly winds. This movement would effectively reduce the “stay-off” distance, potentially causing a hazard to boating public. In light of this, it is recommended that the clevis pin of Cable C_N (50 percent section loss) be replaced with a pin of proper diameter, and that the remaining clevis pins be monitored for increased section losses during future inspections.

Abandoned anchor cables were observed to be resting against bottom and top surfaces of Cable L1s. Although the abandoned anchor cables are inactive, Cable L1s is active and moves as a result of dynamic loading. Therefore, Cable L1s should be monitored during future inspections to ensure that contact from the abandoned cables does not result in abrasion damage to Cable L1s.

The loose/bulging wires noted at various cables likely represents minor damage that resulted from "snagging" the cables during handling or installation. It is recommended that the cables with bulging wires be specifically monitored in the future, since that condition can promote accelerated deterioration. Similarly, it is recommended that the cable corrosion near the abandoned buoy clamp attachments on the south side of the bridge be closely monitored during future underwater inspections.

Finally for the cables, the amount of corrosion noted has again increased slightly since the previous underwater inspection. Numerous cables exhibited moderate and occasionally heavy corrosion, at times, with the early stages of exterior wire section loss due to pitting, especially near the pontoon ports. This suggests that an environment favorable to accelerated corrosion exists near the pontoon ports. This may be the result of higher stresses in the cable close to the ports due to the normal movement of the pontoons and/or the cathodic protection system is not functioning as effectively closer to the pontoons. It should be noted that the manufacturers of structural strand recommend a 15 to 20 year life expectancy under purely static conditions in an aquatic environment. At the Homer Hadley Bridge, however, the cables are subjected to dynamic loading conditions as well, a situation that can reduce the expected life span. Given the age of the remaining cables and some of the deficiencies now present, it is recommended that the cable replacement program be continued. Those cables having the heaviest corrosion with associated section loss and/or broken wires should be given the highest priority for replacement. Currently, Cable Asw exhibits the greatest need for replacement in light of having up to eight broken wires.

If a decision is made to replace cables as a part of WSDOT's on-going bridge maintenance program, in addition to Cables Asw and H_N, Cables Anw, B_N, B_s, C_N, C_s, D_N, D_s, E_N, E_s, F_N, F_s, G_s, K_s,

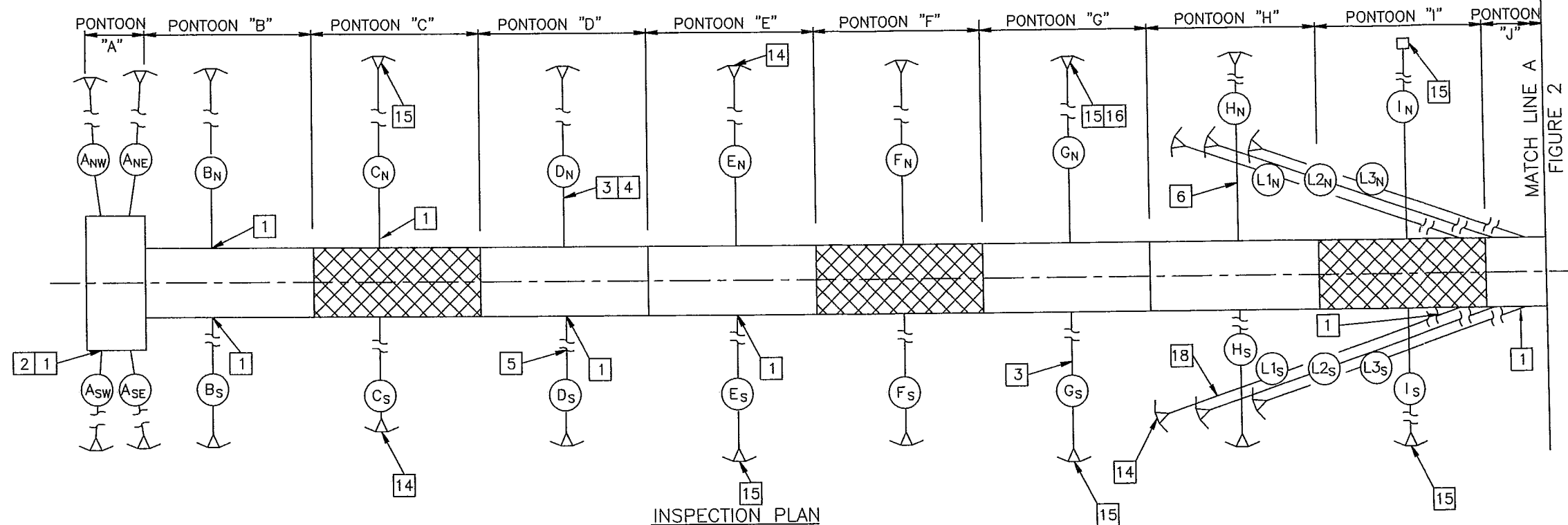
L1s, L3s, L4s, L6N, L6s, Ls, MN, Ms, Ns, ON, Ps and QN can and should also be considered for replacement, with highest consideration given to those cables with broken wires. In the interim, it is recommended that the cables with heavier corrosion, section loss, and broken wires be monitored closely during future biennial underwater inspections. Furthermore it is recommended that cathodic protection measurements be taken near the pontoon ports to verify and insure the system is functioning properly, with any necessary adjustments made based on the measurements. Refer to the end of Appendix B for specific recommended repair and maintenance items for the cables along with their respective priority ratings. The present condition of the pontoons and anchors were such that no recommendations are warranted at this time.

Respectfully submitted,
COLLINS ENGINEERS, INC.

Daniel G. Stromberg, P.E.
Chief Structural Engineer/Diver

APPENDIX A

Figures



INSPECTION PLAN

GENERAL NOTES:

- PONTOONS C, F, I, L, O, AND R WERE FULLY INSPECTED. THE UNDERWATER SURFACES OF THE PONTOONS WERE TYPICALLY COVERED WITH A THIN LAYER OF ALGAE GROWTH. CLEANING OF THE GROWTH REVEALED THE CONCRETE TO BE IN GOOD CONDITION WITH NO SIGNIFICANT STRUCTURAL DEFICIENCIES.
- ALL CABLES WERE INSPECTED BY DIVING TO A WATER DEPTH OF 50 FEET, EXCEPT FOR CABLES BN THROUGH QN, WHICH WERE INSPECTED TO THE BOATER PROTECTION SYSTEM CLAMP. IN ADDITION, CABLES CN, CS, EN, ES, GN, GS, IN, IS, KN, KS, L1S, L4S, L5S, L6S, LN, MN, MS, NN, ON, OS, QN AND QS WERE INSPECTED ENTIRELY FROM THE PONTOON PORT TO THE ANCHOR (OR LAKEBED IF ANCHOR WAS BURIED) BY DIVING OR WITH A ROV.
- THE BOATER PROTECTION SYSTEM WAS IN GENERALLY SATISFACTORY CONDITION WITH A MAJORITY OF THE CLEVIS PINS, AT THE CABLE CLAMP, EXHIBITING UP TO 50% LOSS OF SECTION DUE TO WEAR.
- REFER TO THIS FIGURE, THE INSPECTION SUMMARY TABLE IN APPENDIX B, AND THE UNDERWATER INSPECTION SUMMARY FORMS IN APPENDIX A OF THE REPORT FOR DETAILED FINDINGS FOR PONTOONS, CABLES, AND ANCHORS INSPECTED.

INSPECTION NOTES:

- HEAVY CORROSION, WITH UP TO 1/16" PITTING AND EXTERIOR WIRE SECTION LOSS, COVERING 50% TO 100% OF THE CABLE SURFACE. AFFECTED AREA EXTENDED FROM WITHIN THE PONTOON PORT UP TO WATER DEPTHS OF 17 FEET.
- PROTECTIVE SLEEVE WITHIN THE PONTOON PORT IS OPEN, EXPOSING 6 TO 8 BROKEN CABLE WIRES. SEIZING REPAIRS WERE NOT PERFORMED DUE TO INACCESSABILITY.
- ONE OR MORE WIRES OUT-OF-LAY UP TO ONE WIRE DIAMETER.
- MODERATE ABRASION OF PHILLYSTRAN ARAMID FIBER BUOY ROPE.
- CORROSION NODULES UNDER PREVIOUS SEIZING REPAIR CAUSING INTERMITTENT BULGING OF WIRES UP TO 1/2 WIRE DIAMETERS.
- ONE BROKEN CABLE WIRE AT A WATER DEPTH OF 48 FEET. WIRE WAS SEIZED WITH CABLE TIES DURING INSPECTION.
- MISSING BUOY CLAMP CLEVIS PIN. ASSISTED WSDOT PERSONNEL WITH PIN REPLACEMENT.
- ONE LOOSE WIRE BULGING OUT UP TO ONE WIRE DIAMETER.
- FAILED REPAIRS OF TWO BROKEN CABLE WIRES AT A WATER DEPTH OF 8 FEET. WIRES WERE RE-SEIZED WITH CABLE TIES DURING INSPECTION.
- MISSING BOATER PROTECTION BUOY AND BUOY CLEVIS PIN. ASSISTED WSDOT PERSONNEL WITH BUOY AND PIN REPLACEMENT.
- SOUTH FACE OF FLUKE ANCHOR EXPOSED. VERTICAL EXPOSURE RANGED BETWEEN 3 FEET (ENDS) AND 8 FEET (CENTER).
- PROTECTIVE SLEEVE WITHIN THE PONTOON PORT IS OPEN APPROXIMATELY 4", EXPOSING TOP SURFACE OF CABLE.
- RANDOM AREA OF SECTION LOSS PRESENT ALONG LENGTH OF VERTICAL JOINT
- FULL LENGTH INSPECTIONS REVEALED THE CABLE AND/OR EYEBAR, TO BE PENETRATING THE LAKEBED WITH NO PORTION OF THE ANCHOR EXPOSED.
- FULL LENGTH INSPECTIONS REVEALED THE CABLE, SOCKET, PINS, EYEBAR, ANCHOR CONNECTIONS, AND/OR ANCHOR TO BE PARTIALLY OR FULLY EXPOSED.
- TOP OF FLUKE ANCHOR EXPOSED. VERTICAL EXPOSURE WAS BETWEEN 6 INCHES AND 2 FEET.
- NORTH FACE OF FLUKE ANCHOR EXPOSED. VERTICAL EXPOSURE RANGED BETWEEN 3 AND 4 FEET.
- TWO INACTIVE ANCHOR CABLES OF ABANDONED PONTOONS, RESTING AGAINST CABLE SURFACE AT WATER DEPTHS BETWEEN 160 AND 161 FEET

LEGEND :

- = Type A Fluke Anchor
- = Type B Pile Anchor
- = Type C Gravity Anchor
- = Sunken Pontoon Anchor
- = Cable Designation
- = Inspection Note
- = Pontoon Selected for Inspection

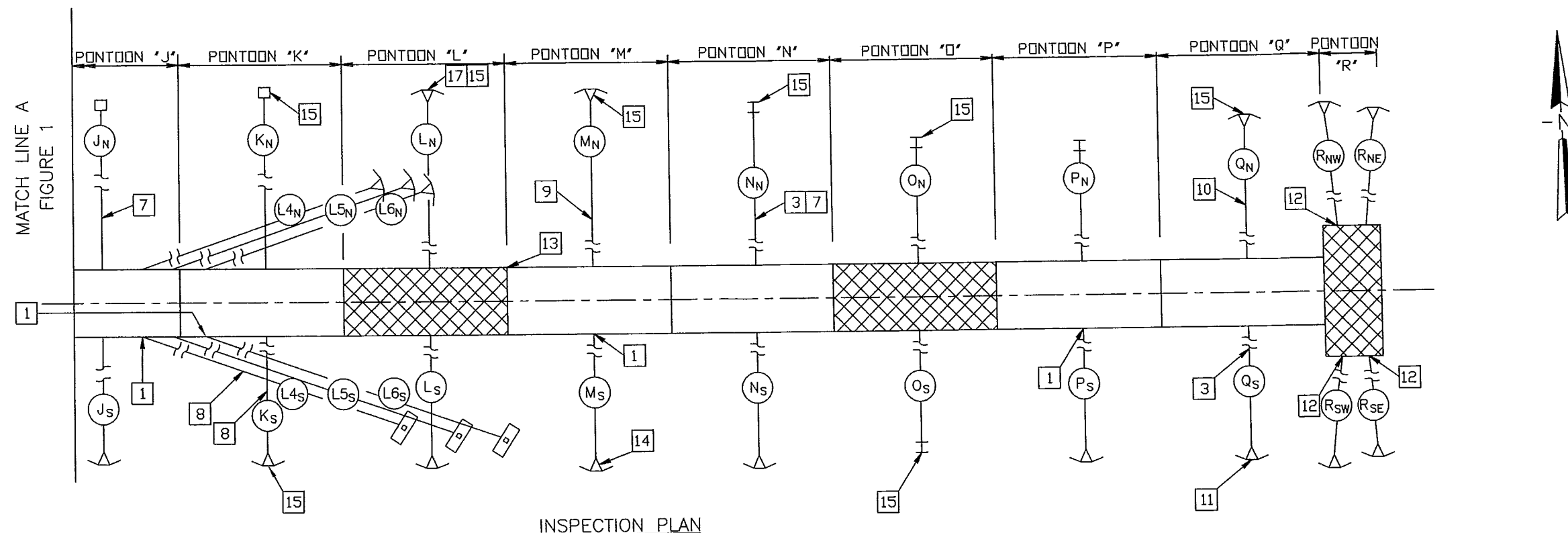
WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

BRIDGE NO. 90/25N
HOMER HADLEY FLOATING BRIDGE
OVER LAKE WASHINGTON

INSPECTION PLAN

Drawn By: BDP	COLLINS ENGINEERS	Date: SEPT, 2006
Checked By: CHC		Scale: NTS
Code: 48280001		Figure No.: 1

745 BLUECRAB ROAD
NEWPORT NEWS, VA 23606
(757) 873-0251



GENERAL NOTES:

- PONTOONS C, F, I, L, O, AND R WERE FULLY INSPECTED. THE UNDERWATER SURFACES OF THE PONTOONS WERE TYPICALLY COVERED WITH A THIN LAYER OF ALGAE GROWTH. CLEANING OF THE GROWTH REVEALED THE CONCRETE TO BE IN GOOD CONDITION WITH NO SIGNIFICANT STRUCTURAL DEFICIENCIES.
- ALL CABLES WERE INSPECTED BY DIVING TO A WATER DEPTH OF 50 FEET, EXCEPT FOR CABLES Bn THROUGH Qn, WHICH WERE INSPECTED TO THE BOATER PROTECTION SYSTEM CLAMP. IN ADDITION, CABLES Cn, Cs, En, Es, Gn, Gs, In, Is, Kn, Ks, L1s, L4s, L5s, L6s, Ln, Mn, Ms, Nn, On, Os, Qn AND Qs WERE INSPECTED ENTIRELY FROM THE PONTOON PORT TO THE ANCHOR (OR LAKEBED IF ANCHOR WAS BURIED) BY DIVING OR WITH AN ROV.
- THE BOATER PROTECTION SYSTEM WAS IN GENERALLY SATISFACTORY CONDITION WITH A MAJORITY OF THE CLEVIS PINS, AT THE CABLE CLAMPS EXHIBITING UP TO 50% LOSS OF SECTION DUE TO WEAR.
- REFER TO THIS FIGURE, THE INSPECTION SUMMARY TABLE IN APPENDIX B, AND THE UNDERWATER INSPECTION SUMMARY FORMS IN APPENDIX A OF THE REPORT FOR DETAILED FINDINGS FOR PONTOONS, CABLES, AND ANCHORS INSPECTED.

INSPECTION NOTES:

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- PROTECTIVE SLEEVE WITHIN THE PONTOON PORT IS OPEN, EXPOSING 6 TO 8 BROKEN CABLE WIRES. SEIZING REPAIRS WERE NOT PERFORMED DUE TO INACCESSABILITY.
- ONE OR MORE WIRES OUT-OF-LAY UP TO ONE WIRE DIAMETER.
- MODERATE ABRASION OF PHILLYSTRAN ARAMID FIBER BUOY ROPE.
- CORROSION NODULES UNDER PREVIOUS SEIZING REPAIR CAUSING INTERMITTENT BULGING OF WIRES UP TO 1/2 WIRE DIAMETERS.
- ONE BROKEN CABLE WIRE AT A WATER DEPTH OF 48 FEET. WIRE WAS SEIZED WITH CABLE TIES DURING INSPECTION.
- MISSING BUOY CLAMP CLEVIS PIN. ASSISTED WSDOT PERSONNEL WITH PIN REPLACEMENT.
- ONE LOOSE WIRE BULGING OUT UP TO ONE WIRE DIAMETER.
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- SOUTH FACE OF FLUKE ANCHOR EXPOSED. VERTICAL EXPOSURE RANGED BETWEEN 3 FEET (ENDS) AND 8 FEET (CENTER).

- PROTECTIVE SLEEVE WITHIN THE PONTOON PORT IS OPEN APPROXIMATELY 4", EXPOSING TOP SURFACE OF CABLE.
- RANDOM AREA OF SECTION LOSS PRESENT ALONG LENGTH OF VERTICAL JOINT
- FULL LENGTH INSPECTIONS REVEALED THE CABLE AND/OR EYEBAR, TO BE PENETRATING THE LAKEBED WITH NO PORTION OF THE ANCHOR EXPOSED.
- FULL LENGTH INSPECTIONS REVEALED THE CABLE, SOCKET, PINS, EYEBAR, ANCHOR CONNECTIONS, AND/OR ANCHOR TO BE PARTIALLY OR FULLY EXPOSED.
- TOP OF FLUKE ANCHOR EXPOSED. VERTICAL EXPOSURE WAS BETWEEN 6 INCHES AND 2 FEET.
- NORTH FACE OF FLUKE ANCHOR EXPOSED. VERTICAL EXPOSURE RANGED BETWEEN 3 AND 4 FEET.
- TWO INACTIVE ANCHOR CABLES, OF ABANDONED PONTOON, RESTING AGAINST CABLE SURFACE AT WATER DEPTHS BETWEEN 160 AND 161 FEET.

LEGEND :

- = Type A Fluke Anchor
- = Type B Pile Anchor
- = Type C Gravity Anchor
- = Sunken Pontoon Anchor
- = Cable Designation
- = Inspection Note
- = Pontoon Selected for Inspection

WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

BRIDGE NO. 90/25N
HOMER HADLEY FLOATING BRIDGE
OVER LAKE WASHINGTON

INSPECTION PLAN

Drawn By: BDP	COLLINS ENGINEERS 745 BLUEGRASS ROAD NEWPORT NEWS, VA 23608 (757) 873-0251	Date: SEPT, 2006
Checked By: CHC		Scale: NTS
Code: 48280002		Figure No.: 2

APPENDIX B

Summary Tables

BRIDGE NO. 90/25N
HOMER HADLEY FLOATING BRIDGE

INSPECTION SUMMARY TABLE (PONTOONS)

ITEM	DEFICIENCIES (PHOTOGRAPH NOS.)	LOCATION (- # = WATER DEPTH)	SIZE
Pontoon C	No deficiencies	No deficiencies	No deficiencies
Pontoon F	No deficiencies	No deficiencies	No deficiencies
Pontoon I	Section of concrete overlapping joint (Photograph No. 1)	Bottom joint at Pontoon G, 20' north of south face of pontoon	1' long by 6"-8" wide
Pontoon L	Section loss from forming (Photograph Nos. 2)	Random locations along north vertical joint at Pontoon M	6"-8" long by 4"-6" wide with up to 1" depth/penetration
Pontoon O	No deficiencies	No deficiencies	No deficiencies
Pontoon R	No deficiencies	No deficiencies	No deficiencies

BRIDGE NO. 90/25N
HOMER HADLEY FLOATING BRIDGE

N=1 : 3
L=2 : 14
M=3 : 19
H=4 : 14
52

INSPECTION SUMMARY TABLE (CABLES)

ITEM	DEFICIENCIES (PHOTOGRAPH NOS.)	LOCATION/REPAIR (-#=WATER DEPTH)
A _{NE}	Moderate corrosion, beginning within the pontoon port, covering 75% of cable	Pontoon port to -2'
	Light corrosion covering 15%-25% of cable	-2' to -10'
A _{NW}	Moderate to heavy corrosion, beginning within the pontoon port, covering 75%-100% of cable	Pontoon port to -10'
	Light corrosion covering 5%-10% of cable	-10' to -15'
A _{SE}	Moderate corrosion, beginning within the pontoon port, covering 50%-75% of cable	Pontoon port to -15'
	Light corrosion covering less than 5% of cable	-15' to -50'
A _{SW}	Open protective sleeve within the pontoon port, exposing six to eight broken cable wires (not repaired during inspection) (Photograph No. 3)	Pontoon port
	Heavy corrosion covering 100% of cable	Pontoon port
	Protective sleeve with broken banding within pontoon port	Pontoon port to -15'
	Light corrosion covering less than 5% of cable	-15' to -50'
B _N	Heavy corrosion, beginning within the pontoon port, covering 75%-100% of cable	Pontoon port to -10'
	Light to moderate corrosion covering 15%-25% of cable	-10' to -50'
	Moderate to heavy corrosion covering 75% of cable	-50' to -75'
	Previous seizing repair in good condition (Photograph No. 4)	-75'
B _S	Heavy corrosion covering 100% of cable within the pontoon port	Pontoon port
	Heavy corrosion covering 50%-75% of cable	Pontoon port to -2'
C _N	Heavy corrosion, beginning within the pontoon port, covering 100% of cable	Pontoon port to -10'
	Previous seizing repair in good condition	-3'
	Moderate corrosion covering 50% of cable	-10' to -30'
	Clevis pin at buoy clamp exhibits 50% loss of section due to wear (Photograph No. 5)	-46'

BRIDGE NO. 90/25N
HOMER HADLEY FLOATING BRIDGE
INSPECTION SUMMARY TABLE (CABLES)
(Continued)

ITEM	DEFICIENCIES (PHOTOGRAPH NOS.)	LOCATION/REPAIR (-#=WATER DEPTH)
C _N	Moderate corrosion covering 25%-50% of cable	-50' to -100'
	Light to moderate corrosion covering 10%-20% of cable	-100' to -140'
C _s	Moderate to heavy corrosion, beginning within the pontoon port, covering 100% of cable	Pontoon port to -2'
	Light corrosion covering 10%-25% of cable	-3' to -50'
D _N	Moderate to heavy corrosion, beginning within the pontoon port, covering 100% of cable (Photograph No. 6)	Pontoon port to -2'
	Light corrosion covering 15%-25% of cable	-2' to -10'
	One wire out-of-lay up to one wire diameter	-40' to -42'
	Previous seizing repair in good condition	-45'
	Moderate abrasion of phillystran aramid fiber buoy rope. (WSDOT personnel notified)	-45'
	Clevis pin at buoy clamp exhibits 30%-35% section loss due to wear (Photograph No. 7)	-45'
D _s	Heavy corrosion, beginning within the pontoon port, covering 100% of cable	Pontoon port to -12'
	Moderate to heavy corrosion covering 75%-100% of cable	-12' to -17'
	Previous seizing repair in good condition	-16'
	Corrosion nodules under previous repairs causing small areas of wire bulging up to 1/2 wire diameter	-17'
	Moderate corrosion covering 5%-15% of cable	-17' to -25'
E _N	Previous seizing repair in good condition	Pontoon port
	Moderate to heavy corrosion, beginning within the pontoon port, covering 100% of cable	Pontoon port to -3'
	Light to moderate corrosion covering 25%-50% of cable (Photograph No. 8)	-3' to -10'
	Clevis pin at buoy clamp exhibits 30% loss of section due to wear	-43'
E _s	Heavy corrosion, beginning within the pontoon port, covering 75%-100% of cable	Pontoon port to -17'

BRIDGE NO. 90/25N
HOMER HADLEY FLOATING BRIDGE
INSPECTION SUMMARY TABLE (CABLES)
(Continued)

ITEM	DEFICIENCIES (PHOTOGRAPH NOS.)	LOCATION/REPAIR (-#=WATER DEPTH)
Es	Previous seizing repair in good condition	-16'
Fn	Light corrosion, beginning within the pontoon port, covering 50% of cable	Pontoon port to -2'
	Light corrosion covering 20% of cable	-2' to -5'
	Clevis pin at buoy clamp exhibits 20%-25% loss of section due to wear (Photograph No. 9)	-46'
Fs	Moderate corrosion, beginning within the pontoon port, covering 50% of cable	Pontoon port to -15'
	Previous seizing repair in good condition	-16'
Gn	Light corrosion, beginning within the pontoon port, covering 10%-20% of cable	Pontoon port to -3'
	Clevis pin at buoy clamp exhibits 25%-35% loss of section due to wear	-45'
	Light corrosion covering 10% of cable	-50' to -205'
Gs	Light to moderate corrosion, beginning within the pontoon port, covering 50%-75% of cable	Pontoon port to -50
	Previous seizing repair in good condition	-16'
	One wire out-of-lay one wire diameter	-40' to -45'
Hn	Moderate corrosion, beginning within the pontoon port, covering 50%-75% of cable	Pontoon port to -4'
	Clevis pin of buoy clamp exhibits 10% - 15% loss of section due to wear (Photograph No. 10)	-47'
	One broken cable wire (repaired during inspection)(Photograph Nos. 11 and 12)	-48'
Hs	Moderate corrosion, beginning within the pontoon port, covering 50%-75% of cable	Pontoon port to -2'
	Light to moderate corrosion covering 15%-25% of cable	-2' to -50'
In	Clevis pin of buoy clamp exhibits 35% loss of section due to wear	-47'
	Light corrosion covering 25%-50% of cable	-50' to -185'
Is	Moderate corrosion, beginning within the pontoon port, covering 50%-75% of cable	Pontoon port to -2'

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BRIDGE NO. 90/25N
HOMER HADLEY FLOATING BRIDGE
INSPECTION SUMMARY TABLE (CABLES)
(Continued)

ITEM	DEFICIENCIES (PHOTOGRAPH NOS.)	LOCATION/REPAIR (-#=WATER DEPTH)
J _N	Moderate corrosion, beginning within the potion port, covering 100% of cable (Photograph No. 13) Light corrosion covering 10% of cable (Photograph No. 14) Missing clevis pin at buoy clamp (repaired during inspection) (Photograph No. 15 and 16)	Pontoon port to -3' -3' to -5' -40'
J _s	Moderate to heavy corrosion, beginning within the pontoon port, covering 50%-75% of cable Light corrosion covering 10%-15% of cable	Pontoon port to -4' -4' to -50'
K _N	Light corrosion, beginning within the pontoon port, covering 5% of cable Clevis pin at buoy clamp exhibits 30%-35% loss of section due to wear Light corrosion covering 25%-50% of cable	Pontoon port to -3' -46' -50' to -139'
K _s	Moderate to heavy corrosion, beginning within the pontoon port, covering 100% of cable Light to moderate corrosion covering 25%-50% of cable Light corrosion covering 15%-25% of cable One loose wire bulging out one wire diameter	Pontoon port to -2' -2' to -4' -4' to -6' -6' to -8'
L1 _N	Moderate corrosion, beginning within the pontoon port, covering 100% of cable Light to moderate corrosion covering 10%-50% of cable Scattered, light corrosion covering 5%-10% of cable Random, light corrosion covering less than 5% of cable	Pontoon port to -10' -10' to -15' -15' to -30' -30' to -50'
L1 _s	Heavy corrosion, beginning within the pontoon port, covering 100% of cable Moderate corrosion covering 25%-50% of cable Light to moderate corrosion covering 15%-25% of cable Anchor cable is resting on top of an anchor cable from sunken, abandoned pontoon. Abandoned cable traverses north to south (Photograph No. 17)	Pontoon port to -4' -4' to -10' -10' to -50' -160'

BRIDGE NO. 90/25N
HOMER HADLEY FLOATING BRIDGE
INSPECTION SUMMARY TABLE (CABLES)
(Continued)

ITEM	DEFICIENCIES (PHOTOGRAPH NOS.)	LOCATION/REPAIR (-#=WATER DEPTH)
L1s	Anchor cable of sunken, abandoned pontoon, rests on top of anchor cable. Abandoned cable traverses north to south (Photograph No. 18)	-162'
L2N	Moderate corrosion, beginning within the pontoon port, covering 100% of cable Light corrosion covering 10% of cable Two wires out-of-lay 3/4 to one wire diameter Light to moderate corrosion covering 15%-25% of cable	Pontoon port to -3' -3' to -6' -6' to -11' -10' to -50'
L2s	No deficiencies	No deficiencies
L3N	Light corrosion covering 100% of cable within the pontoon port Light corrosion covering 50% of cable Light corrosion covering 5%-10% of cable	Pontoon port Pontoon port to -2' -3' to -10'
L3s	Heavy corrosion, beginning within the pontoon port, covering 100% of cable (Photograph No. 19) Moderate corrosion covering 25%-50% of cable Light to moderate corrosion covering 15%-25% of cable	Pontoon port to -4' -4' to -10' -10' to -50'
L4N	Light corrosion covering 5% of cable within the pontoon port	Pontoon port
L4s	Heavy corrosion, beginning within the pontoon port, covering 100% of cable Previous seizing repair in good condition One loose wire bulging out up to one wire diameter	Pontoon port to -2' -30' -42' to -52'
L5N	Light corrosion covering 10% of cable within the pontoon port	Pontoon port
L5s	Moderate corrosion, beginning within the pontoon port, covering 50%-75% of cable	Pontoon port to -5'
L6N	Moderate to heavy corrosion, beginning within the pontoon port, covering 100% of cable Moderate to heavy corrosion covering 30% of cable Light to moderate corrosion covering less than 10% of cable	Pontoon port to -4' -4' to -8' -8' to -15'
L6s	No rubber pads secured to cable within the pontoon port	Pontoon port

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BRIDGE NO. 90/25N
HOMER HADLEY FLOATING BRIDGE
INSPECTION SUMMARY TABLE (CABLES)
(Continued)

ITEM	DEFICIENCIES (PHOTOGRAPH NOS.)	LOCATION/REPAIR (-#=WATER DEPTH)
L6s	Heavy corrosion, beginning within the pontoon port, covering 100% of cable	Pontoon port to -4'
	Moderate corrosion covering 25%-50% of cable	-4' to -10'
	Light corrosion covering 5%-10% of cable	-10' to -30'
LN	Clevis pin at buoy clamp exhibits 35% loss of section due to wear	-46'
	Scattered, light corrosion covering less than 5% of cable	-50' to -147'
Ls	Heavy corrosion, beginning within the pontoon port, covering 100% of cable	Pontoon port to -2'
	Light corrosion covering 25%-50% of cable	-2' to -4'
MN	Light to moderate corrosion, beginning within the pontoon port, covering 15%-25% of cable	Pontoon port to -2'
	Failed repairs of two broken cable wires (repaired during inspection)(Photograph Nos. 20 and 21)	-8'
	Clevis pin of buoy clamp exhibits 10%-15% loss of section due to wear	-35'
Ms	Heavy corrosion, beginning within the pontoon port, covering 100% of cable	Pontoon port to -2'
	Light to moderate corrosion covering 25%-50% of cable	-2' to -4'
NN	Light corrosion, beginning within the pontoon port, covering 10% of cable	Pontoon port to -2'
	Two wires out-of-lay up to 3/4 wire diameter (Photograph No. 22)	-16' to -20'
	Missing clevis pin at buoy clamp. (assisted WSDOT personnel with repairs)(Photograph No. 23)	-25'
Ns	Moderate to heavy corrosion, beginning within the pontoon port, covering 50% of cable	Pontoon port to -3'
	Light to moderate corrosion covering 10%-15% of cable	-20' to -40'
ON	Light corrosion, beginning within the pontoon port, covering less than 5% of cable	Pontoon port to -8'
	Clevis pin of buoy clamp exhibits 30%-40% loss of section due to wear (Photograph No. 24)	-22'